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ABSTRACT

A study used a unique data set to evaluate the effect of Targeted Jobs Tax Credit (TJTC) on the labor market outcomes of program participants--more than 29,000 individuals for whom Pennsylvania businesses sought tax credits during 1988-94 (final sample was 17,388). Firm-level data were combined with wage data obtained from administrative quarterly wage records of the Pennsylvania Department of Labor and Industry. Earnings and labor market tenure of two groups of workers eligible for TJTC were examined: workers who applied for and were certified by the government as eligible for the TJTC and workers who applied for but were disqualified from the program because of paperwork or other application problems. TJTC participation led to substantial earnings gains for eligible female workers. Certified workers aged 23-26 earned 18-28 percent more per quarter than comparable uncertified workers. The cumulative income gains to TJTC participants exceeded the $2,400 maximum tax credit granted to employers. Certified workers were more likely to be employed than their uncertified counterparts. Greater on-the-job experience attributable to TJTC subsidized employment explained at least part of the earnings differential. The earnings differential persisted during 1995 and 1996 after expiration of the TJTC program in 1994. (Appendixes contain 9 references and 21 endnotes.) (YLB)

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Targeted Jobs Tax Credits and Labor Market Experience

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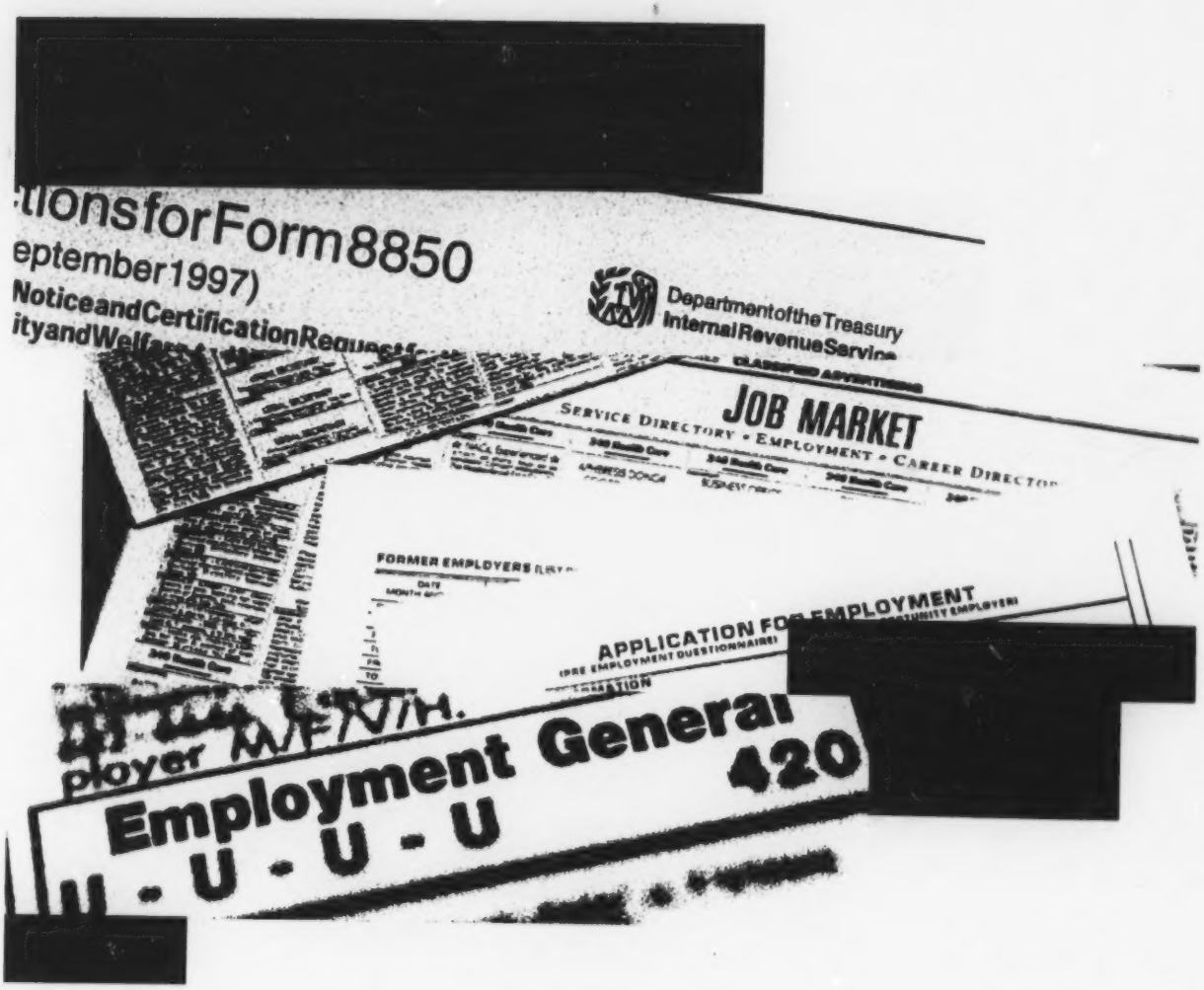

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Executive Summary

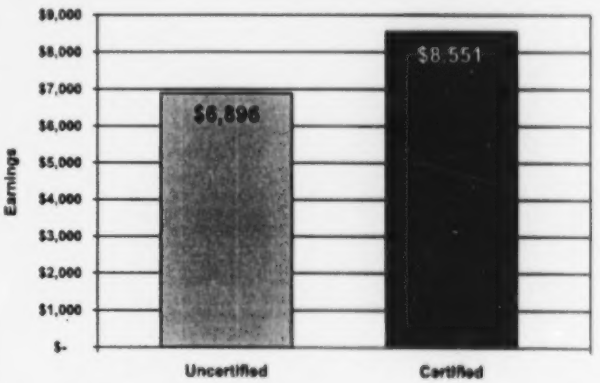
The work requirements of the 1996 welfare reform legislation have refocused attention on the need for government programs that help members of economically disadvantaged segments of the population find and keep jobs. In this report, Dr. Tannery examines the effectiveness of one such program, the Targeted Jobs Tax Credit (TJTC). (See box, p.ii.) Based upon a long-term analysis of more than 17,000 Pennsylvania workers, he finds that participation in the TJTC program had a strong positive effect on workers' earnings and labor force participation, and that this effect persists for many years after participation in the TJTC program.

Dr. Tannery examines the earnings and labor market tenure of two groups of workers eligible for TJTC, disadvantaged youths aged 18-22 and welfare recipients, for evidence regarding its effectiveness. Specifically, he compares the earnings of workers who applied for and were certified by the government as eligible for the TJTC with the earnings of workers who applied for but were disqualified from the program because of paperwork or other application problems. The characteristics of these two groups of workers are unlikely to differ in any systematic way; hence, the analysis should provide unbiased evidence about whether or not the TJTC program increased the earnings and job tenure of eligible disadvantaged workers.

TJTC and Welfare Recipients

Among welfare recipients, Dr. Tannery finds that participation in the TJTC program led to substantial earnings gains for eligible female workers. Certified female welfare recipients in their late 20s and early 30s earned from 9% to 32% more per quarter than their uncertified counterparts. For the average female worker earning approximately $1,800 per quarter, these results imply an earnings differential of $650-$2,300 per year in each of the four years studied. *Hence, the cumulative income gains to*

Annual Earnings of Female Welfare Recipients Age 25 by TJTC Certification Status



TJTC participants exceed the $2,400 maximum per-worker cost of the program.

TJTC and Disadvantaged Youths

Dr. Tannery analyzes the earnings of disadvantaged youths during the first four years after their eligibility for the TJTC program expired at age 22. He finds that certified workers aged 23-26 earned between 18% and 28% more per quarter than comparable uncertified workers. For the average worker earning approximately $2,500 per quarter, this translates into a difference of $1,800-$2,800 per year in each of the first four years after which a disadvantaged youth is no longer eligible for the TJTC. This once again suggests that the cumulative income gains to TJTC participants exceed the $2,400 maximum tax credit granted to employers.

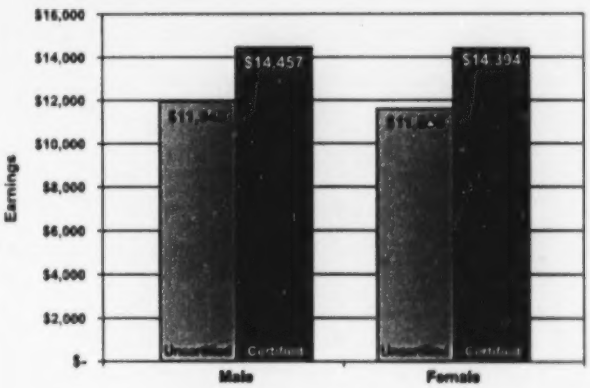
How the Targeted Jobs Tax Credit (TJTC) Program Worked

In 1978, Congress enacted the TJTC program to help difficult-to-employ individuals find work, and amended the program numerous times thereafter before allowing it to lapse at the end of 1994. From 1986-94, the TJTC provided the employer of an eligible worker with a tax credit equal to 40% of the worker's wages in the first year of employment or $2,400 per employee, whichever was less. The program expired at the end of 1994.

Workers were eligible for TJTC if they were members of one of several groups, including youths aged 18-22 from economically disadvantaged families, recipients of Aid to Families with Dependent Children (AFDC), and recipients of general assistance. These groups are the focus of this study, as they account for about 80% of the available data. Other eligible groups included economically disadvantaged summer youths aged 16-17, handicapped persons referred by state vocational rehabilitation or Veterans Administration programs, economically disadvantaged Vietnam veterans, economically disadvantaged ex-offenders, and recipients of Federal Supplemental Security Income.

On October 1, 1996, the TJTC was, in large part, reinstated in the form of the Work Opportunity Tax Credit (WOTC). The WOTC is very similar to the TJTC, though eligibility criteria are narrower. Initially, the tax credit was good for 35% of first-year earnings, capped at $2,100, and the employee had to stay on the job at least 180 days. This was later changed to a credit of 25% for workers staying on the job between 120-400 hours, and 40% for workers who stayed more than 400 hours. Also, the WOTC includes a new provision requiring employers to complete a pre-hire screening form to establish the new hire's eligibility.

Annual Earnings of Disadvantaged Youth Age 25 by TJTC Certification Status



Dr. Tannery's results also suggest that certified workers are more likely to be employed than their uncertified counterparts, and that greater on-the-job experience attributable to TJTC subsidized employment explains at least part of the earnings differential between certified and uncertified workers.

Long-Term Benefits of the TJTC

Finally, Dr. Tannery tests whether the earnings differential between certified and uncertified workers persisted during 1995 and 1996, after the expiration of the TJTC program in 1994. He finds that the differential did, indeed, remain after the program ended. Among disadvantaged youths, Dr. Tannery finds that certified workers earned 16%-18% more than did their uncertified counterparts, with the differential being somewhat larger for males (21%-22%) than for females (10%-13%). Among welfare recipients, he finds that certified females earned 14%-19% more than uncertified females. This is strong evidence that the gains from the TJTC program are long-term, most probably attributable to greater work experience gained during TJTC-subsidized employment. Such gains are likely to persist a lifetime, making the TJTC program an especially effective policy tool for fighting poverty.

Did the TJTC Program Create Jobs?

Because many of the TJTC program's participants were certified for the tax credit after they had been hired, critics argue that the program created very few jobs. What these critics ignore, however, is the fact that the TJTC is an incentive for employers to lengthen the tenure of these jobs, which are typically short-term in nature. It is precisely this increase in tenure, and the accompanying job experience, that leads to the greater earnings associated with TJTC certification.

Moreover, the retroactive certification process may well have benefitted those who were *not* certified for the TJTC by creating job openings that would not have been available in the absence of the TJTC. Employers hired many of the certified and uncertified workers based upon the knowledge that some percentage of workers would eventually be certified for the tax credit. By lowering a firm's aggregate labor costs, the TJTC increased demand by these firms for all potential TJTC workers.

Conclusion

In this study, Dr. Tannery demonstrates that the societal benefits of wage-subsidy programs such as the TJTC go far beyond job creation. These programs also lead employers to extend the job tenure of targeted workers who are members of disadvantaged groups. With greater experience, the earnings of these workers will rise not only during their participation in the program, but for the rest of their lives. Hence, the cumulative benefits of these wage-subsidy programs are far greater than previously thought. Similar programs might be especially effective as policymakers seek ways to find employment for the most-difficult-to-hire welfare recipients, those who have thus far been unable to find work even in a booming economy.

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Targeted Jobs Tax Credits and Labor Market Experience

1. Introduction

The work requirements imposed by the 1996 welfare-reform legislation have raised concerns among critics about the ability of welfare recipients to make the transition into the work force. These critics point to the consequences if welfare recipients are not able to find and hold jobs, and their concerns have focused attention on programs and policies to help current welfare recipients overcome obstacles to steady employment. One such policy is government subsidization of the costs of hiring workers through a program like the now-expired Targeted Jobs Tax Credit (TJTC), which offsets a fraction of the first-year wages paid by employers to workers hired from difficult-to-employ populations.

*[E]ven the smallest estimates for disadvantaged youths... indicate that certified workers earn about $500 more **per quarter** than those not certified. Among female welfare recipients, certification increases earnings from just under $200 to more than $600 **per quarter** during the ages from 25 to 33.*

This study uses a unique data set to evaluate the effect of the TJTC on the labor market outcomes of program participants. Firm-level data containing worker characteristics are combined with wage data obtained from administrative quarterly wage records. Participants are followed for as long as four years after certification for the tax credit. The study documents the labor market experiences of workers certified for tax credits and contrasts their experiences with those of essentially identical workers who were not certified because of application and paperwork errors.

The data set used here exploits the sharp increase in the incidence of claims and the screening mechanism of the Pennsylvania State Employment Security Agency (SESA) to provide a direct comparison of workers certified for the TJTC with an otherwise identical group who applied for, but were disqualified from, the program for administrative reasons, i.e., paperwork errors such as missing data or signatures. Budget limitations in claims processing led Pennsylvania to adopt an automated screening system. Any errors on an application resulted in a disqualification rather than a certification or a rejection. To the extent that application errors were not systematically related to either individual or firm characteristics, both the measured and unmeasured characteristics of the non-certified group of workers should be comparable to those of the treatment group.

The results of the study indicate that workers certified for tax credits under the TJTC program enjoyed substantial earnings advantages in subsequent years over a control group of workers whose applications for the tax credit were disqualified. Regression estimates of earnings gains from certification vary between participation groups and across different model specifications. However, even the smallest estimates for disadvantaged youths, which control for the

possibly confounding effect of pre-program productivity differences, indicate that certified workers earn about $500 more *per quarter* than those not certified. Among female welfare recipients, certification increases earnings from just under $200 to more than $600 *per quarter* during the ages from 25 to 33. The estimates of certification's effect on the earnings of men on welfare were sometimes large, but were not statistically significant.

These earnings estimates do not account for the impact of certification on a worker's employment stability. Regression estimates of certification which account for the incidence of employment are substantially larger than those based only on employed workers. Furthermore, certification has a positive and statistically significant impact on the number of quarters employed during the study period.

One important feature of the data set is the availability of a comparison group that is insulated from the selection bias that usually taints policy-evaluation studies. In most such studies, there are systematic differences in the treatment and control groups resulting from nonrandom selection of the treatment group that confound straightforward measurement of the treatment effects. This selection problem makes it difficult to measure the effectiveness of a program "treatment," as we do not know what the earnings of those in the program would be in the absence of the treatment. While many studies rely on comparison groups comprised of individuals with similar observed characteristics,[1] differences in unmeasured characteristics between the treatment and comparison groups may bias the estimated effects of the programs.

2. The Targeted Jobs Tax Credit (TJTC) Program

Congress first enacted the TJTC program in 1978 to help difficult-to-employ individuals find work, and amended the program numerous times thereafter before allowing it to lapse at the end of 1994.[2] From 1986-1994, the TJTC provided the employer of an eligible worker with a tax credit equal to 40% of the worker's wages in the first year of employment or $2,400 per employee, whichever was less. Workers were eligible for TJTC if they were members of one of several groups, including youths aged 18-22 from economically disadvantaged families, recipients of Aid to Families with Dependent Children (AFDC), and recipients of general assistance. These groups are the focus of this study, as they account for about 80% of the available data.[3]

Firms could obtain tax credits for hiring members of targeted populations who were "vouchered" and/or "certified" by the State Employment Security Agency (SESA) as eligible for the TJTC. The SESA would issue vouchers to workers who were eligible for the TJTC program, hence the term, "vouchered." Workers would then present the voucher to prospective employers as an inducement to hiring. Once the firm had hired a worker, the firm would request a certification from the SESA, which, when issued, entitled the firm to take a tax credit for new employees, provided that they worked at least 90 days or 120 hours. However, most workers, and all workers in this sample, did not obtain SESA vouchers before they began working for the firm requesting the tax credit.

A firm also could obtain the TJTC for hiring nonvouchered workers so long as (1) it believed the workers were eligible for the TJTC, and (2) it notified the state before these workers began their jobs. This process was called "retroactive certification," as firms often made job offers prior to the formal determination of whether workers were eligible for the TJTC.[4] If the firm's certification application was complete, and the worker met the eligibility criteria for the TJTC, SESA would issue the firm a certification for a tax credit. The firm would then receive a tax credit for

part of the worker's first year earnings, provided the worker was subsequently employed by the firm for 90 days or 120 hours.[5]

Previous research on the TJTC gives a mixed picture of its effectiveness. Burgess (1985) reports a "scarring" effect of vouchering on welfare populations, as a voucher signaled potentially low productivity that more than offset the tax credit. Hollenbeck and Smith (1984), however, find no scarring effect on disadvantaged youth. Hollenbeck *et al.* (1986) report a positive effect of TJTC vouchering and certification on the employment rates and average wages of both disadvantaged youths and welfare recipients, although vouchering appeared to lower wages while working. The positive impact of certification is also based on a comparison group who found jobs. In a study commissioned by the National Commission for Employment Policy (NCEP), Lorenz (1988) shows that workers earn more after vouchering, but the higher earnings are temporary. Five years after vouchering, he finds that only one of seven demographic groups earned significantly more than a comparison group. However, the lack of statistical significance for the earning differential may be due to small sample sizes, as vouchered groups earned an average of $1,000 more annually than the comparison groups.

These studies differ in their data and estimation methodology. Lorenz (1988) and Hollenbeck *et al.* (1986) both use nationally representative TJTC samples combined with administrative wage records, similar to the data used in this study. However, Hollenbeck *et al.* (1986) uses a comparison group of workers who are eligible and not vouchered, while Lorenz (1988) uses a comparison group of vouchered but noncertified workers.[6] Furthermore, the data in these studies are from the early 1980s, so that the results may be affected by slack business conditions at that time. Results based on data from the early 1980s are also less valuable for current policy considerations.

3. Data and Descriptive Statistics

This study is based on an initial sample of more than 29,000 individuals for whom Pennsylvania businesses sought tax credits during the 1988-94 period. Each applicant was either certified for a tax credit or their application was not processed because of a paperwork error or other problem.[7] Applicants denied certification by the SESA are excluded from the analysis.[8] A tax credit was not issued for all certified applicants, as 29% of certified workers in this study were not employed long enough to qualify for the tax credit. Certified workers for whom no tax credit was issued are included in the analysis, as, presumably, many of those whose applications were not acted upon would have also not satisfied the work requirement. While all tax credit requests were made for wages paid from 1988-94, most of the following analyses exclude certifications before 1992, as information about where applicants lived is not available in the earlier years. Because the tax credits could be obtained retroactively, many certifications occurred in 1995 after the program ended. Employers of these workers sought tax credits for earnings paid during 1994.

Data used in this study come from two sources: certification application forms and administrative quarterly wage records of the Pennsylvania Department of Labor and Industry. The application form provides information on social security number, TJTC category, birth date, zip code, gender, a tax-credit eligibility indicator, and, for those applications that were complete, the date the application was certified. Unfortunately, race is not directly available. However, 1990 census data were used to create a proxy variable for race: the percentage of the population in an applicant's zip code area that was Black. Cases with missing data were dropped. This eliminated more than 10,000 cases with missing zip codes or zip codes outside Pennsylvania. Additional cases were dropped if there were missing birth dates or gender codes.

Complete information was available for a final sample of 17,388 TJTC applicants.

It is important to note that all of the firms included in this study contracted with management-assistance companies (MACs) to process their TJTC claims. The MACs interviewed newly hired workers, completed the certification applications, and sent them to the Pennsylvania SESA for approval. MACs played an important role in the TJTC program. The complexity of the program and the reluctance of employers to interact with government agencies resulted in low participation rates after the program began in 1978. MACs were developed to aid firms in getting tax credits for newly hired workers.[9] By the end of the 1980s, MACs were responsible for more than half of all claims for tax credits (Lorenz 1995). The growth in the incidence of applications over the 1988-94 period suggests that MACs grew in importance over the sample period.

Applications filed by MACs are unlikely to constitute a random sample of all applications, even for those submitted to the Pennsylvania SESA. MACs typically represented firms in the retail-trade sector, where many inexperienced workers find jobs.[10] These firms also tended to be larger than average, as larger firms hire more workers and have more to gain from participating in the program. Critics of the TJTC program[11] have focused on the role of MACs, which led to large increases in requests for certification of workers who critics argue would have been hired even without the tax credits. These critics maintain that the TJTC provided windfall gains to firms in the retail-trade and service industries, which tend to hire a large number of workers for relatively short durations.[12]

This study also uses wage records obtained from the Pennsylvania Department of Labor and Industry, which are used to operate the Unemployment Insurance program. Every employer must report quarterly wages for each employee. Quarterly earnings, unemployment benefits, and employer identification number (EIN) are listed on these records. For workers with multiple employers, the principal employer is regarded as the one paying the most wages in the quarter. These wage records were merged with TJTC application data for each worker.

The data have some shortcomings. First, interstate differences in the employers' responses to the TJTC cannot be measured because both the claims data and the wage data come only from Pennsylvania employers. Second, the data do not allow us to distinguish among workers who drop out of the labor force, workers who become unemployed, and workers who take jobs out of state, because the wage data are available only from Pennsylvania. Third, the data provide quarterly earnings but not information on weeks worked per quarter or hourly earnings. Offsetting these disadvantages, the data provide accurate information on the earnings of workers eligible for the TJTC before and after the period of certification, and on the earnings of a control group of workers with similar characteristics. Also, the large sample size permits stratifications based on various criteria, and the timeliness of the data make it particularly useful for policy purposes.

The information available for the comparison group does not include the date of initial employment at a firm requesting a tax credit, or the date when SESA disqualified a firm's application. Hence, earnings comparisons surrounding the certification date are not possible because no dates are available for workers not certified. This problem is compounded by the one-year hiatus in the program between July 1992 and June 1993. When the program was re-authorized, the earnings of workers hired during this period were also eligible for tax credits. Because of these data limitations, this study focuses on comparisons of workers' earnings at different ages. As a disadvantaged youth under age 23 can qualify for a tax credit, earnings differences between certified and noncertified workers age 23 and older will be

the basis for estimating the effects of certification. The study also includes an analysis of the earnings of certified and noncertified workers in 1995 and 1996, after the TJTC program expired in 1994.

Following Hollenbeck *et al.* (1986), earnings are measured by both the average quarterly earnings and the average quarterly earnings while employed. Analysis of these alternative earnings measures is especially important in this study because the available data only identify income earned in Pennsylvania, so that zero income may signify that a worker is unemployed, has exited the labor force, or is working in a different state. Hence, restricting the analysis to quarterly data with nonzero earnings provides a lower bound estimate of the benefits of certification to the extent that certified workers are more likely to remain employed. Alternatively, analysis of all of the quarterly data produces an upper bound estimate of the TJTC program's effect, but this estimate is confounded by the effect of workers employed out of state.

Table 1 presents the characteristics of TJTC applicants by target group (disadvantaged youths or welfare recipients) and certification status (certified or noncertified). Among disadvantaged youths (Panel A), certified workers were, on average, older, more likely to be female, and more likely to live outside the densely populated Southeastern part of the state.[13] Differences in the spatial distribution of applicants by certification status account for the smaller proportion of Blacks in the locales of certified youth, as 60% of the state's Black population lives in Philadelphia.

Among welfare recipients (Panel B), certified workers were younger, were more likely to be female, were less likely to live in Southeast Pennsylvania, and were less likely to be on AFDC. Compared with disadvantaged youths, welfare recipients were more likely to be female and were more likely to live in a locale with a higher concentration of Black residents, regardless of certification status.

Table 2A lists the average quarterly earnings of disadvantaged youths while employed (in constant 1995 dollars) by gender and by age, while Table 2B lists similar information for welfare recipients.[14] Among disadvantaged young men, certified workers earn more at every age than do the noncertified, and these differences are statistically significant at each age. These findings suggest that the selection process for certification may be related to worker productivity or other firm characteristics that are related to its wage structure. If certified workers were relatively more productive than those not certified, the effect of certification would be biased upward due to these pre-program differences. However, neither the earnings of disadvantaged female youths nor the earnings of welfare recipients are consistently higher among certified workers in the years before their employers applied for the tax credits. It seems unlikely that the screening mechanism would select only the most productive disadvantaged young men, but not the most productive disadvantaged young women or welfare recipients. Among disadvantaged young men, the gaps in the earnings of certified and noncertified workers widens even after the maximum age (22) of eligibility. Certified young women, however, had lower earnings between the ages 18 and 22, followed by higher earnings after age 22, when they were no longer eligible for the TJTC as disadvantaged youths. None of these differences are statistically significant, however. Certified women were also more likely to work at ages 21 to 24, but less likely to work at age 26.

The earnings of welfare recipients, shown in Table 2B, cannot be separated into pre- and post-program participation because there is no age boundary on eligibility. Among male welfare recipients, certified workers enjoyed higher earnings than the noncertified from ages 20 to 24 and at age 32. The earnings of certified women welfare participants were lower than those of their noncertified counterparts for 10 of the 14 age cohorts. However, these simple comparisons do not control for differences in local economic

conditions, and the data in Table 1 indicate that certified workers were less likely to live in the more prosperous parts of the state. And none of the differences in the earnings of certified and non-certified welfare recipients are statistically significant.

The earnings data in Tables 2A and 2B are not informative about how earnings change immediately following certification. Figure 1 provides this information by charting the average quarterly earnings (in constant 1995 dollars) while employed during the two years before and the three years after certification. Earnings are plotted separately for workers certified before and after the one-year hiatus in the TJTC from July 1992 through June 1993.[15] The earnings path of workers certified after 1992 is similar to that of workers certified before 1992, except for the three quarters prior to certification. Unlike those certified before 1993, the earnings of those certified later in the study period do not drop during the quarters prior to certification; instead, they begin to increase in the quarter prior to certification. These disparate results suggest that there is a one-to-two quarter lag between the date a worker is hired and the date the worker is certified.

[C]ertified workers enjoyed large earnings gains that extended for at least two years beyond the period of subsidized earnings

Real earnings grow sharply for workers certified during both time periods. Because the TJTC subsidy is good for only one year, Figure 1 clearly shows that certified workers enjoyed large earnings gains that extended for at least two years beyond the period of subsidized earnings (quarters 1 to 4). Given the flat earnings prior to certification and the relatively low hourly wages in the retail trade sector where most of these workers were employed, rapid earnings growth suggests that employers increased the workers' hours or rates of pay in response to the wage subsidy. While studies have criticized TJTC placements as low-wage jobs in the retail trade sector, the earnings growth in Figure 1 shows that participants realized sustained increases in earnings paid either by the employer claiming the tax credit or by subsequent employers.

On average, earnings are falling in the pre-certification period. The reduction in earnings is consistent with TJTC eligibility, as those whose earnings were growing over time would not have satisfied the TJTC eligibility criteria. It is somewhat surprising that the earnings of those certified early in the period did not increase with the minimum wage hike in April 1991. Either enough workers already had earnings in excess of the new minimum wage, or firms reduced workers' hours to offset the higher wage rates.

Unfortunately, no comparable figure can be sketched for the noncertified workers because there is no certification date for these workers. However, the earnings growth of certified and noncertified workers listed in Table 2 underscores the importance of these jobs to all workers. Because most of these jobs are short-term positions, TJTC participants appear to gain important job experience and training that enable them to subsequently find jobs paying even higher wages.

4. Regression Methodology

To qualify for a tax credit under the disadvantaged youth program, a worker had to be age 18-22, and his or her employer had to apply for the tax credit by the time the worker turned age 23. Applications for workers older than age 22 would be disqualified; no certification decision would be made. Hence, this study focuses on the earnings of disadvantaged youth *after* the age of eligibility.

The large sample size makes possible separate estimation of the earnings of previously disadvantaged youths by age for those in the 23–26-year-old age bracket.

To evaluate the effects of the TJTC program, we compare the outcomes of individuals certified for the tax credit with the outcomes that would be expected for these same individuals in the absence of the certification. Because we cannot observe the outcome of the path not taken, the outcomes of noncertified individuals serve as proxies for what the certified workers would have earned in the absence of certification. More formally, we are interested in:

$$E[Y^1_{it} - Y^0_{it} \mid d_i = 1] \qquad (1)$$

or

$$E[Y^1_{it} \mid d_i = 1] - E[Y^0_{it} \mid d_i = 1], \qquad (2)$$

where Y^1_{it} is the earnings of individual *i* at time *t* if certified, Y^0_{it} is the earnings of individual *i* at time *t* if not certified, and $d_i = 1$ if a worker is certified. The second term in (2) represents the earnings of a noncertified worker conditional upon certification and is hence not observed. Instead, we observe:

$$E[Y^1_{it} \mid d_i = 1] - E[Y^0_{it} \mid d_i = 0], \qquad (3)$$

i.e., differences between the earnings of certified and noncertified workers.

Given that the certification decision is based on application problems, the second term in equation (3) approximates its counterpart in (2). This enables us to estimate the effect of certification as:

$$Y_{it} = \beta_0 + \beta_1 T_i + \beta_j X_{it} + \varepsilon_{it}, \qquad (4)$$

where X_{it} is a vector of characteristics, T_i is a certification indicator equal to 1 if certified and 0 otherwise, and ε_{it} is an error term. The ßs are the parameters to be estimated by ordinary least squares for different groups of workers.

Unlike the usual selection problem in policy evaluation, neither worker nor firm decisions affect certification status. However, if certification status is related to worker characteristics, then T_i and ε_i are correlated and the estimates in equation (4) are biased.

5. Regression Results

5.1 The Effect of TJTC Certification on the Earnings of Disadvantaged Youths

Table 3 shows the effect of certification on the subsequent quarterly earnings (in constant 1995 dollars) of disadvantaged youths. For each age cohort in column 1, the table presents the estimated certification effect, its associated *t*-statistic , and the sample size. In columns 2-4 are the results based upon only those quarters when a worker reported non-zero earnings, while the results based upon all quarters appear in columns 5-7. The table reports the results for all workers (Panel A) and separately for males and females (Panels B and C, respectively). Also included in the regression model but not shown in Table 3 are binary indicator variables indicating regions in the state, the applicant's gender (omitted when estimating the model separately for men and women), the applicant's year of birth (which controls for the year of earnings), and a continuous variable measuring the percentage of the residents in the applicant's zip code area that are Black. The complete regression results appear in Appendix Tables 1-3.

Column 2 reports the effect of certification during the *employed quarters* for all disadvantaged youths. The coefficients are positive and statistically significant for each age cohort 23 to 26. Moreover, the size of the coefficients indicates that the benefits of certification increase with age. Certified disadvantaged youths at ages 23, 24, 25, and 26 earn 18%, 21%, 23%, and 28% more per quarter, respectively, than do noncertified youths. For disadvantaged male youths, the statistically

significant earnings differentials between certified and noncertified workers were even greater for the oldest cohort (35%), but smaller for the 23-year-old workers (14%). For disadvantaged female youths, the earnings advantage from certification varies from 17% to 24%, but is not statistically significant for workers at age 26. The lack of precision for this latter estimate may be attributable to the small sample size of that cohort (only 291 workers), as indicated in column 4. This is fewer than half as many workers as in the next largest cohort.

When the earnings in *all quarters* are analyzed rather than just the quarters with nonzero earnings, the effect of certification on earnings increases for each cohort except at age 26.[16] The larger effect of certification when the earnings over all quarters are analyzed suggests that certified workers, and younger workers in particular, are more likely to remain employed in the state than their noncertified counterparts. The very large 39% estimate on the earnings of workers age 23 suggests that certification plays an important role in binding young adults to the work force. The lack of statistical significance for the oldest workers analyzed, however, suggests that this role diminishes over time, or that older workers are more likely to find work out of state.

[C]ertification plays an important role in binding young adults to the work force

The higher earnings of certified male youths documented in Table 2A suggest that the disqualification of applications may be related to worker productivity. To control for this possibility, the model was re-estimated with an additional control variable for possible productivity differences: the log of earnings at age 18. Only those reporting nonzero earnings at 18 are included in this analysis, as the concern is about how variation in the earnings at age 18 affect post-TJTC earnings, and not whether those who worked at this age are more likely to work afterwards. Also, only nonzero earnings quarters are included in the analysis. Appendix Tables 4 and 5 display the full set of regression results, while Panel D of Table 3 shows only the effects of certification.

In general, inclusion of the log of the quarterly earnings at age 18 reduces the magnitude of the certification effect on quarterly earnings of disadvantaged youths, except for females age 25. For disadvantaged male youths, two of the four certification estimates remain statistically significant at least at the 5% level, and the other two are borderline significant at the 10% level.[17] The relatively small effect of the "earnings at age 18" variable on earnings at ages 23-26 suggests that certification and pre-TJTC productivity are not strongly related. Also, precisely estimated certification effects for 24-and 25-year-old men allays fears that a subtle selection process increases the relative productivity of certified TJTC participants.

Estimates of the effect of certification on the earnings of disadvantaged female youths are less affected by controlling for earnings at age 18, as one would expect from the mean quarterly earnings in Table 2A. In fact, the estimated impact of certification on the earnings of females age 25 is larger than that estimated without the earnings at 18 variable. However, the estimated effect of certification on the earnings of females at age 26 is very close to 0. The large divergence in the size of the certification coefficient for 25-and 26-year-old females is surprising because the 26-year-olds are a subset of the 25-year-olds from one year earlier. Thus, it appears that the certified females who earned more at age 25 were either more likely to leave the sample, have interrupted work experience, or otherwise experience lower earnings in the next year. The small sample size in the earnings regression for 26-year-old women may be responsible for some of the large reduction in the effect of certification as it less precisely estimated.

In regression models including the "earnings at age 18" control variable, even the smallest estimates of the effect of TJTC certification on earnings show that certified workers earned more than non-certified workers. For disadvantaged male youths aged 24 and 25, who earned approximately $3,000 per quarter, the estimated coefficient of 0.17 implies that certification increased earnings by more than $500 per quarter. For disadvantaged female youths aged 24 and 25, the estimated coefficients imply that certification increased earnings by $450 and $985 per quarter, respectively. These estimates imply that the earnings premium from certification during these ages more than offsets the cost of the one-year tax credit, even if firms collected the full amount of the tax credit for all those certified.[18] The substantially larger estimates obtained when earnings in all quarters is the dependent variable reflect the stronger ties of certified workers to the employers. Hence, certification increases the earnings of those who remain employed and also increases the within state employment rate.

Among 25-year-old welfare recipients whose average earnings were $1,800 per quarter... certified workers earned about $400 per quarter, or about $1,600 per year, more than noncertified workers.

5.2 The Effect of TJTC Certification on the Earnings of Welfare Recipients

Table 4 presents the effect of certification on the quarterly earnings of welfare recipients by age and gender. It is similar in structure to Table 3, except that earnings are measured at ages 25, 27, 29, 31, and 33 instead of 23, 24, 25, and 26. Once again, the control variables included in the regression model are dummies indicating the region of the state where the applicant worked, the applicant's sex, and the applicant's year of birth, and a continuous variable measuring the percentage of residents in the applicant's zip code area that are Black. Complete regression results are found in Appendix Tables 6-8.

While there is no TJTC age requirement for welfare recipients, most applicants were relatively young when they began working for the firm requesting the tax credit. Hence, each row of Table 4 reports the effect of certification on the earnings of workers at specific ages; 25, 27, 29, 31, and 33. There are too few observations on the earnings of welfare recipients older than age 33 to allow for meaningful inference. In each regression, the certification variable equals one if a worker had been certified before reaching the age specified by the cohort in the dependent variable and zero otherwise. For example, the regression results for 25-year-old workers include a certification variable that is equal to one if the worker was certified by age 25, but equal to zero if the worker was older than 25 when certified. These regressions also include another variable indicating whether the worker was eventually certified. It is not known, however, if a worker whose application was disqualified had applied for the tax credit by the specified age of the cohort included in the regression.

Panel A of Table 4 displays the effects of certification on the quarterly earnings while employed for all welfare recipients. The coefficients in Panel A indicate that TJTC certification increased earnings by 11%-22%, and that the effect of certification falls with age; for workers older than age 30, the estimates are not statistically significant. Among 25-year-old welfare recipients whose average earnings were $1,800 per quarter, the estimated certification coefficient of 0.22 implies that certified workers earned about $400 per quarter, or about $1,600 per year, more than noncertified workers.

Panels B and C of Table 4 display the effects of certification on the quarterly earnings of male and female welfare recipients, respectively. By gender, certification generally increases the earnings of females more than males, as the estimated certification coefficient is consistently larger for females than for males of the same age. Using employed quarters only, the effect of certification on the earnings of male welfare recipients is not statistically significant for any age cohort, but is significant for females age 25 and 29. Using all quarters, the effect of certification is significant for males age 25 and 31, and for females age 25, 27, 29, and 33. Moreover, the estimated effect of certification on earnings in all quarters, reported in the columns on the right side of Table 4, is quite large. For example, female welfare recipients age 27, 29 and 33 earn about twice as much when certified as when not certified, largely because certified workers are more likely to be employed. Again, these estimates obtained using all quarters of data may overstate the influence of certification to the extent that those who leave the sample work in other states.

[F]emale welfare recipients age 27, 29 and 33 earn about twice as much when certified as when not certified, largely because certified workers are more likely to be employed.

5.3 Earnings Differentials in 1995 and 1996

Table 5 presents the estimated effects of certification obtained from regression models explaining the natural log of quarterly earnings in 1995 and 1996, which is after the TJTC program ended. The impact of TJTC certification is shown for both disadvantaged youths and welfare recipients, and is estimated using only data from quarters with nonzero earnings and with data from all quarters, regardless of employment alternates. Control variables once again include regional dummy variables, dummy variables representing the applicant's age, and the proportion of the residents in the applicant's zip code area who are Black.[19] Complete regression results appear in Appendix Tables 9-14.

Panel A of Table 5 shows the effect of certification on the 1995 and 1996 earnings of disadvantaged youths. When we examine only quarters with positive earnings, we find that certified workers earned 16%-18% more than noncertified workers. The earnings advantage was somewhat larger (21%-22%) for males and somewhat smaller for females (10%-13%), but in all cases, the estimated coefficients are statistically significant at better than the 1% level. When we examine all quarters, the earnings advantage is even larger for 1995, but is smaller and statistically insignificant in 1996.

Panel B of Table 5 shows the effect of certification on the 1995 and 1996 earnings of welfare recipients. When we examine only quarters with positive earnings, we find that certified workers earned 12%-16% more than noncertified workers. Here, however, the certification effect is greater for females (14%-19%) than for males (10%-11%). The coefficients for males are significant at better than the 10% level, and the coefficients for females and for all welfare recipients are significant at better than the 1% level. At least for females, the consequences of including quarters without earnings sharply increases the impact of certification because certified workers were more likely to work during these quarters. When we examine all quarters, the effect of certification for females increases to 68% in 1995 and 60% in 1996. For males, however, the estimated coefficients are no longer statistically significant. Overall, the relatively large effect of certification with either dependent variable implies a substantial

earnings advantage for certified workers in the post-TJTC period.

The impact of certification on the earnings of welfare participants is very large relative to the earnings differences listed in Table 2B. One explanation for this anomaly is that workers who have yet to be certified are suffering depressed earnings prior to qualifying for welfare. For example, the 32% earnings advantage for women at age 29 reflects the higher earnings of women after being certified for the tax credit compared to others at the same age who are experiencing negative income shocks before getting welfare. The estimated effect of certification combines the earnings gains of certified over noncertified with the earnings differences of those headed out of welfare and those headed onto welfare rolls. However, higher earnings of certified welfare recipients in the post-TJTC period more clearly demonstrate the value of certification to welfare recipients.

Because employers do not bear the full costs of employing certified workers, they are more likely to hire these workers, as well as more likely to keep them on the payroll during business downturns.

5.4 The Effect of the TJTC on Worker Experience

One potential source of the earnings gains we have documented for certified workers is greater job experience. Because employers do not bear the full costs of employing certified workers, they are more likely to hire these workers, as well as more likely to keep them on the payroll during business downturns. Together, these factors should result in greater job experience for certified relative to noncertified workers.

To test this proposition, this study investigated how a TJTC participant's job experience varies with certification and other control variables. Job experience is defined as the number of quarters that the worker had positive earnings in the period beginning with the first quarter the worker was employed until the end of 1996, divided by the total number of quarters in this period. As shown in Table 6, the certification variable is positive and significant in explaining job experience for both male and female disadvantaged youths, and for female, but not male, welfare recipients. The 0.055 coefficient for disadvantaged male youths implies that certified workers in this group were employed 5.5% more of the time than were noncertified workers in this group. For a disadvantaged male youth employed continuously from the first quarter of 1987 through the fourth quarter of 1996, this coefficient implies 2.2 more quarters of experience for a certified relative to a noncertified disadvantaged male youths. The certification coefficient for disadvantaged female youths is somewhat smaller (0.034), while the certification coefficient for female welfare recipients is somewhat larger (0.062).[20] Overall, this analysis suggests that certification led to greater job experience, and that this differential in experience may explain the greater earnings of certified relative to noncertified workers.

6. Concluding Remarks

Workers certified for tax credits under the TJTC program enjoyed substantial earnings advantages in subsequent years over a control group of workers whose applications for the tax credit were disqualified. Regression estimates of earnings gains from certification vary between participation groups and across different model specifications. However, even the smallest estimates for disadvantaged youths, which control for the

possibly confounding effect of pre-program productivity differences, indicate that certified workers earn about $500 more *per quarter* than those not certified. Among female welfare recipients, certification increases earnings from just under $200 to more than $600 *per quarter* during the ages from 25 to 33. The estimates of certification's effect on the earnings of men on welfare were sometimes large, but were not statistically significant.

These earnings estimates do not account for the impact of certification on a worker's employment stability. Regression estimates of certification which account for the incidence of employment are substantially larger than those based only on employed workers. Furthermore, certification has a positive and statistically significant impact on the number of quarters employed during the study period.

Some have criticized the retroactive feature of the TJTC program[21] as providing a "windfall" gain to employers for hiring workers who they presumably would have employed anyway. The data analyzed in this study show that many workers for whom employers requested certification as eligible for the TJTC were disqualified. Workers who were certified have much higher earnings in subsequent years than did these disqualified workers. Hence, certification is an important "treatment" among those who were employed, regardless of the retroactive feature of the TJTC program.

Moreover, the retroactive certification feature of the program likely increases the earnings and experience of noncertified workers relative to what they would be in the absence of the TJTC. Because firms do not know *a priori* which workers will be certified as eligible for the TJTC, the possibility of obtaining the tax credit should induce firms to hire people who would not be hired in the absence of the subsidy. These workers benefit from this job experience and hence follow higher earnings paths than they would have followed in the absence of the TJTC. This study does not address the issue of whether or not people hired under the TJTC program would have been hired in the absence of the program, in which case the wage subsidies might represent windfall gains to employers. This criticism, however, implies that firms do not alter their employment policies in response to the offer of the wage subsidy. Given that these firms contracted with specialists to help process claims, and considering the growth in the number of tax credit claims, it may be that firms respond to the subsidy by hiring more workers, by hiring for longer periods, and by offering these jobs to workers who would likely qualify for the subsidy. It may be possible to further investigate this issue by examining the employment pattern of firms claiming tax credits in the post-TJTC period.

Furthermore, these results suggest that the focus on the hiring decision is myopic. Among those for whom a tax credit application was filed, those certified had higher future earnings. The important issue is the role of wage subsidies in the opportunities of low-income populations. The outcomes of TJTC participants in this study support the use of wage subsidies to get low-income groups into the economic mainstream.

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Endnotes

[1] See LaLonde (1988) for a comparison of non-experimental outcomes with results based on experimental data.

[2] On Oct. 1, 1996, the TJTC was, in large part, reinstated in the form of the Work Opportunity Tax Credit (WOTC). The WOTC is very similar to the TJTC, but initially the tax credit was only 35% of first-year earnings, capped at $2,100, and eligibility restrictions were somewhat different. In addition, the employed has to complete a pre-hire screening form to establish the new hire's eligibility, and the employee has to stay on the job at least 180 days.

[3] Other eligible groups included economically disadvantaged summer youths aged 16-17, handicapped persons referred by state vocational rehabilitation or Veterans Administration programs, economically disadvantaged Vietnam veterans, economically disadvantaged ex-offenders, and recipients of Federal Supplemental Security Income.

[4] Bishop and Kang (1991) cite the results of an employer survey in which a large majority screened for TJTC eligibility after the hiring decision was made.

[5] More than 29% of certified workers in the sample failed to qualify for the tax credit because they did not work for the employer long enough to qualify.

[6] Lorenz (1988) is effectively estimating the effect of certification as a treatment conditional upon a voucher. Selection bias arises because certified workers found jobs while vouchered workers did not.

[7] Officials in Pennsylvania maintain that some applications were not received before workers hired by firms requesting the tax credits began their jobs.

[8] About 10% of requests for certification were denied. Most denials were in the means-tested welfare and disadvantaged-youth categories, as increases in family income would render workers ineligible for these categories. It is unlikely that excluding workers who were denied the certification based on having too high of an income would skew the results in favor of a larger effect of certification on earnings.

[9] Lorenz (1995) notes that information obstacles often prevented firms from obtaining tax credits for eligible workers.

[10] The earnings gains of workers in the retail trade sector are probably a lower bound estimate of the earnings for all workers because retail trade jobs typically pay lower wages than jobs in other sectors.

[11] See Lorenz (1995) for a discussion of the role of MACs and a criticism of the TJTC program.

[12] Bishop and Montgomery (1993) find that, at most, three jobs are created for every ten TJTC placements.

[13] The regional dummies pick up the effect of local labor market conditions, as the unemployment rate was relatively high, and the employment growth rate relatively low in Western Pennsylvania during the study period.

[14] The earnings correspond to the average quarterly earnings in the calendar year that a worker reaches a given age.

[15] The Omnibus Budget Reconciliation Act of 1993 reauthorized employer tax credits retroactively for eligible workers hired after July 1, 1992.

[16] The dependent variable will only be zero when a TJTC participant reported no earnings during the entire calendar year. Otherwise, the variable is the average earnings during the quarters in which they worked.

[17] In another specification, the age 18 earnings variable was replaced with a dummy variable indicating whether or not a worker had reported earnings in the year prior to becoming 18. This variable could be associated with the worker's determination. The certification effect remained positive and significant in this specification.

[18] Tax credits were not awarded for about 29% of certified workers who were not employed long enough to qualify for the tax credit. Other firms did not get the $2,400 maximum credit because the earnings paid qualified for a credit less than the maximum. Allowing for inflation would reduce the percentage of the tax credit covered by the earnings of 25 year-old workers by about 10%, as price increases averaged slightly less than 3% per year during the sample period.

[19] An alternative specification including the earnings in 1990 produces similar results.

[20] The data only cover employment within the state of Pennsylvania, and hence omit employment of Pennsylvania workers in jobs outside the state, as well as uncovered jobs. However, it is not clear whether data from quarters where zero earnings are reported should be excluded. Estimates of experience based on those with zero and positive earnings are biased upwards, because some of those with zero reported earnings were employed in other states or in uncovered activities. The estimates based solely on those with positive earnings are biased downward because those who truly had zero earnings are excluded.

[21] See Lorenz (1995).